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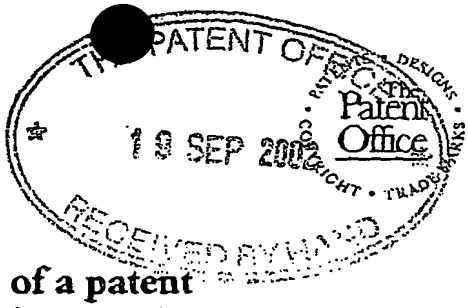

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20SEP02 E749696-1 D03312
P01/7700 0.00-0221806.3

2. Patent application number
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0221806.3

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

DAVID J ROSS
BEECHVILLE
31 BIRKHILL ROAD
CAMBUSBARRON
STIRLING FK7 9LA
SCOTLAND
UNITED KINDOM

84677 55001

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

UNITED KINGDOM

4. Title of the invention

CAST-CUTTER

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

CRUIKSHANK & FAIRWEATHER
19 ROYAL EXCHANGE SQUARE
GLASGOW
G1 3AE
SCOTLAND
UNITED KINGDOM

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CRUIKSHANK & FAIRWEATHER 19 SEPTEMBER 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

ANDREW SHANKS
0141 221 5767

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CAST-CUTTER

The present invention relates to a cutter, and in particular, but not exclusively, to a cutter for use in removing a cast used to immobilize an injured body part from a limb or otherwise of a patient.

Typical "plaster" casts for use in immobilising limbs or other parts of the body are composed of a padded fibre layer surrounded by a plaster or fibre glass tape layer. Conventional cast cutters remove such casts by cutting through the plaster or fibre glass layer, with the padded layer subsequently being cut using scissors, or other like instruments. This is normally repeated at opposing sides of the cast to enable the cast to be removed in two sections.

Conventional cast-cutters typically comprise an oscillating blade which abrades or saws the plaster or fibre glass. As a result, large quantities of dust may be produced and dispersed within the air. In order to minimise the release of dust particles, a dust extraction device is required, which may be cumbersome and adds additional expense to the cutting device.

Furthermore, conventional cutters are noisy in operation due to the action of the blade and a high speed motor, and the presence of the extraction device, which can

be distressing, particularly to young patients. As a result, patients may become agitated, which makes removal of the cast without causing injury more difficult.

Additionally, in use, the blades of conventional cutters may become heated due to friction between the blade and the cast, which introduces the risk of burning the skin of the patient.

Due to the above problems, cast cutters which involve cutting the cast by a sawing action, even when operated by a skilled operator, may result in distress and injury to the patient.

It is an object of embodiments of the present invention to obviate or at least mitigate the aforementioned problems.

According to a first aspect of the present invention, there is provided a cast-cutter for use in removing a cast from a patient, the cast-cutter comprising:

a body;

cutting means supported by the body and adapted for removing a portion of material from the cast by a shearing action; and

a protection member supported by the body and adapted to be positioned between the cutting means and the patient, to protect the skin of the patient.

Thus, in use, the protection member may be placed adjacent or against the skin of a patient and the cutting

means aligned with an end portion of the cast to be removed. Once in position, the cutting means may be activated and the cast-cutter moved along the length of the cast, with the protecting member sliding under the cast, to remove material from the cast without the possibility of causing injury to the patient.

Conveniently, the shearing action of the cast-cutter allows the cutting means to cut through the entire thickness of the cast, through both rigid and padded fibre or bandage layers, for example, eliminating the requirement for scissors or the like to cut through soft material once the rigid material has been cut using conventional methods.

Preferably, the cutting means is adapted for removing a strip of material from the cast. By cutting a strip of material from a cast by a shearing action, the noise and dust problems associated with rotating or oscillating blades are substantially reduced or eliminated, which reduces patient discomfort and anxiety. Furthermore, because the skin of the patient is protected while the device is in use, the possibility of inadvertently causing injury therero is minimised.

Conveniently, the cast-cutter may be used in the removal of a cast from a patient by cutting a strip from alternative, and preferably opposing sides of the cast such that the cast may be removed in two portions. Alternatively, the cast-cutter may be used to cut a single

strip from the cast with the cast subsequently being spread to such an extent so as to be safely removed from the patient. In this instance, the cast-cutter is particularly advantageous in that it removes a strip of cast material of a suitable width to allow a conventional spreading tool or device to be properly and readily inserted into the gap in the cast formed by the removal of the strip. It should be noted however that the cast-cutter may be used to cut any number of strips from the cast as required to allow smooth and safe removal from the patient.

Preferably, the protection member is supported by the body via a connecting member which is coupled at one end to the body and at another end to the protection member. Conveniently, the connecting member is adjustable in order to vary the distance between the body and the protection member in order to accommodate casts of varying thicknesses, for example.

Preferably, the protection member is releasably coupled to the body portion, allowing individual protection members formed for a specific use to be selected and coupled to the cast-cutter as required. For example, various shapes and sizes of protection members may be used with the cast-cutter in accordance with the type, size and location of the cast to be removed.

Preferably, the protection member comprises a contact surface for contacting the skin of a patient when the cast-

cutter is in use. Advantageously, said contact surface is smooth in order to reduce the friction between the contact surface and the skin of a patient, allowing smoother operation and minimising discomfort experienced by the patient. The contact surface may have a substantially planar surface, or alternatively may have a slightly curved surface.

Conveniently, the protection member may comprise tapered edges in order to be smoothly guided under the cast.

Preferably, the cutting means of the cast-cutter is suitable for cutting various types of casts, including plaster casts and synthetic, glass fibre casts which may comprise glass fibre tape or other similar casting material.

Conveniently, the cutting means is adapted to cut material by a shearing action by the interaction of first and second portions, each comprising at least one cutting edge which in use cooperate to produce a shearing strain in a material positioned therebetween.

Preferably, the cutting means comprises a first portion defining an aperture having a cutting edge, and a second portion having a cutting edge and adapted to be received within said aperture, such that when a section of cast is positioned between said first and second portions, sufficient relative movement therebetween will result in a

section of material being sheared from the cast by the cooperative cutting edges. For example, the first portion may define a rectangular aperture having at least two parallel cutting edges, and the second portion may have a rectangular shaped face which corresponds to the rectangular aperture in the first portion, and may have at least two parallel cutting edges for cooperation with those of the first portion.

Advantageously, the first portion of the cutting means may be stationary, and the second portion may be moveable, such that in order to effect cutting of a section of a cast, the second portion is moved towards said first portion when the cast is positioned therebetween.

Conveniently, the first portion may be mounted on the protection member or may be integrally formed therewith. Alternatively, the first portion may be mounted on the connecting member which connects the protection member to the body of the cast-cutter.

Advantageously, the second portion may be mounted on the body and may be reciprocally moveable along a linear path relative to the first portion. In an alternative embodiment, the second portion may be pivotally mounted relative to the first portion and may be moved towards the aperture in the first portion along an arcuate path. Alternatively further, the second portion may be rotatably mounted relative to the first portion and may be suitably

formed and arranged to shear a cast material upon rotation. Preferably, when the second portion operates by rotation, means are provided, either individually, or integrally with the second portion, to assist in moving the cast-cutter along the length of the cast.

Alternatively, the first portion of the cutting means may be moveable, and the second portion may be stationary, such that a section of cast positioned between said first and second portions will be sheared by movement of the first portion towards the second portion.

In use, the cutting means of the cast-cutter may shear discrete fragments of material from the cast, such that each cutting action of the cutting means will remove individual segments of material from a cast. Alternatively, a continuous strip of material may be removed from the cast wherein the cutting means is adapted to progressively remove a complete strip from the length of the cast. In one embodiment of the present invention, a leading edge of the second portion of the cutting means which is received in the aperture of the first portion may be chamfered such that during a cutting action, the cast material will not be completely sheared from the cast, allowing a continuous strip of material to be removed. Alternatively, the aperture in the first portion of the cutting means may be open or chamfered at one side to prevent cutting of the cast material at that side. It should be noted that any

suitable arrangement may be utilised which would prevent any shearing of the cast material in the region of one side of the first and second portions.

Alternatively, the cutting means may be adapted to remove both discrete fragments of material, and continuous strip from the cast. For example, the cast-cutter may initially be used to remove a continuous strip, which continuous strip may be terminated at any required point by the cutting means. This arrangement may be particularly advantageous for use in the removal of complex casts wherein the cast-cutter initially removes a continuous strip which is subsequently terminated to realign the cast-cutter to proceed in the removal of the cast.

Conveniently, where the cast-cutter is adapted to remove continuous strips of material from a cast, the first portion of the cutting means may comprise a strip exit to allow a strip of the cast which is being removed to pass therethrough, preventing blockage of the cutting means and assisting in efficient removal of the strip of cast material. The strip exit preferably comprises tapered sides, which sides may taper outwards, away from the aperture of the first portion. Providing the strip exit with tapered edges in this manner assists in the free movement of the strip and prevents the strip from blocking the strip exit. Additionally, the tapered edges allow the cast-cutter to more readily be operated along a curved or

arcuate path.

Preferably, the cutting means is operated by electric drive means. Alternatively, the cutting means is operated by hydraulic drive means. Alternatively further, the cutting means may be operated by pneumatic drive means. It should be noted, however, that any suitable drive means may be used which would readily be selected by a person of skill in the art.

Advantageously, the cast cutter is powered by an electrical power supply, such as a mains supply, or alternatively, or indeed additionally, by a local power supply such as a battery pack. Preferably, where the cast-cutter is powered by a battery pack, the battery pack is rechargeable. Additionally, the battery pack may be removable from the cast-cutter for recharging, replacing or disposal or otherwise.

Conveniently, the cast-cutter may be activated by depressing or otherwise closing a normally open switch, and deactivated by releasing the switch.

Preferably, the cast-cutter comprises a safety switch which has to be depressed or released before the main switch can be operated. This prevents the cast-cutter from being inadvertently activated by accidentally depressing the main switch.

Preferably, the cast-cutter further comprises a safety guard disposed around the cutting means to prevent

accidental injury by trapping a finger, for example, while the cutter is in use. The guard may be fixed in place or alternatively may be retractable to allow access to the cutting means for cleaning or maintenance, for example. Preferably, where the safety guard is retractable, the guard includes a safety switch such that the cast-cutter may only be operated when the safety guard is positioned correctly in place.

Advantageously, the cast-cutter may further comprise means for collecting the sections of cast which have been removed. The collecting means may comprise a container attached to the body portion of the device. Alternatively, the collecting means may be a separate receptacle located remote from the cast-cutter and connected thereto by a flexible tubular member or the like.

According to a second aspect of the present invention, there is provided a method of removing a cast from a patient, said method comprising the steps of:

providing a cast cutter having shearing cutting means and a protecting member;

placing the protecting member adjacent the skin of the patient such that the protecting member is located between the skin of the patient and the cutting means;

aligning the cutting means with the end of the cast; and

activating and moving said cast-cutter along the

length of the cast to remove a strip of material therefrom, allowing the cast to be removed from the patient.

Preferably, the method further comprises the steps of:

placing the protecting member of the cast-cutter against the skin of the patient and aligning the cutting means with an alternative end portion of the cast; and

activating and moving the cast-cutter along the length of the cast to allow the cast to be removed in two portions.

The above steps may be repeated as required in order to safely remove the cast from the patient.

These and other aspects of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a cast-cutter in accordance with an embodiment of the present invention;

Figures 2 to 6 show various embodiments of cutting means of the cast-cutter shown in Figure 1;

Figures 7a, 7b, 7c, 8 and 9 show a portion of cutting means for use in the cast-cutter shown in Figure 1 in accordance with alternative embodiments of the present invention; and

Figure 10 shows a perspective view of a safety guard for use with the cast-cutter shown in Figure 1.

Reference is first made to Figure 1 of the drawings in which there is shown a cast-cutter 10 in accordance with

one embodiment of the present invention. The cast-cutter 10 is shown in use removing a cast 12 from a body part 14 of a patient. The cast-cutter 10 comprises a protective shoe 16 and cutting means 18 which are both supported by a body portion 20 of the cast-cutter 10. As shown, the protective shoe 16 is positioned between the cutting means 18 and the body part 14, thus protecting the patient from injury during operation.

The cast-cutter 10 further comprises a main switch 22 and a safety switch 23, both located on a handle 24, said switches 22, 23 for activating the cutting means 18. In the embodiment shown, the cast-cutter 10 is operated by electric drive means and is provided with electrical energy via electrical cable 26.

As shown in Figure 1, the protective shoe is supported by the body portion via a connecting member 26 which is coupled at one end to the body portion 20 and at another end to the protective shoe 16.

In use, the protective shoe 16 is placed against the skin of the patient's body part 14 and the cutting means 18 are aligned with an end portion of the cast 12. Once in position, the cutting means 18 are activated by depressing switch 22, in combination with the safety switch 23, and the cast-cutter 10 is moved along the length of the cast 12, with the protective shoe sliding under the cast 12, to remove a strip of material therefrom without the

possibility of causing injury to the patient. The cast-cutter 10 preferably includes a safety guard as described hereinafter with reference to Figure 10.

The cutting means 18 effects cutting of the cast 12 by a shearing action. In the embodiment shown, the cutting means 18 comprises a first, fixed portion 30 formed integrally with the protective shoe 16, and a second portion 32 reciprocally mounted on the body portion 20 of the cast-cutter 10. The fixed portion 30 defines an aperture 38 (Figure 2) having a cutting edge 39 (Figure 2), which aperture 38 is adapted to receive a cutting edge 34 of the second portion 32 of the cutting means 18. Thus, when a cast 12 is positioned between the first and second portions 30, 32 of the cutting means 18, and the cutting means 18 are activated, interaction between the cutting edge 34 of the second portion 32 with the cutting edge 39 of the aperture 38 in the fixed portion 30 will result in a section of the cast being sheared therefrom. Thus, the reciprocating motion of the second portion 32 of the cutting means 18 in combination with the advancing movement of the cast-cutter 10 along the length of the cast 12 will result in a strip of the cast being removed.

A detailed description of various embodiments of the cutting means 18 of the present invention will now be described with reference to Figure 2 to 6.

Referring initially to Figure 2, there is shown a

simplified perspective view of the cutting means 18 of a cast-cutter in accordance with an embodiment of the present invention. The cutting means 18 comprises a fixed, first portion 30 defining a rectangular aperture 38 having two parallel cutting edges 39, the fixed portion 30 adapted for receiving a second portion 32 having a rectangular shaped face which corresponds to the rectangular aperture 38 in the first portion 30, and has two parallel cutting edges 34 for cooperation with the cutting edges 39 of the first portion. The second portion 32 is reciprocally mounted on the cast-cutter (not shown) and will cut a portion of material from the cast on a downstroke. It should be noted that the term "downstroke" used in this context relates to the direction of movement of the second portion 32 with respect to the orientation of the representation. However, in more general terms, downstroke should be understood to mean a stroke of the second portion 32 in an outward direction relative to the body portion of the cast-cutter. Thus, a section of material which is sheared from the cast will be ejected from below the fixed portion 30.

Referring now to Figure 3, an alternative cutting means arrangement will be described. As in the embodiment shown in Figure 2, the cutting means comprises a fixed portion 44 defining an aperture 46 having cutting edges 47 (only one shown), within which aperture 46 is received a moveable portion 48 which is reciprocally mounted on the

cast-cutter. The moveable portion 48 includes cutting edges 50, which cooperate with the cutting edges 47 of the aperture 46 to shear material from the cast being removed. In the embodiment shown in Figure 3, the moveable member 48 cuts the cast on its upstroke, and ejects the sheared section of cast from above the aperture 46 in the fixed portion 44.

A further arrangement is represented in Figure 4 wherein a cutting means is shown which comprises a stationary first portion 52 having an aperture 54, and a moveable second portion 56 which is pivotally mounted in said aperture 54 via pivot pin 58. In use, a portion of a cast to be removed is positioned between the first and second portions 52, 56 and the moveable portion 56 is pivoted within said aperture 54, such that the cast is sheared by respective cutting edges 60, 62 of the aperture 54 and the second portion 56. As with the embodiment shown in Figure 2, the sheared cast portion is ejected from below the first portion 52.

Reference is now made to Figures 5 (a) and (b) in which there is shown a cross-sectional side view and a bottom view respectively of a cutting means of a cast-cutter in accordance with one embodiment of the present invention. The cutting means 18 is similar to that shown in Figure 2 in that it comprises a fixed first portion 64 defining an aperture 66 for receiving a second moving

portion 68. The cutting means 18 shown in Figure 5 is adapted for cutting a strip 70 of material from a cast 12, wherein the strip 70 is ejected from the fixed portion 64 through a strip exit 72. The leading edge of the second portion 68 is chamfered 74 such that during a cutting action, the cast material will not be completely sheared from the cast, allowing a continuous strip 70 to be removed. It should be noted that the term "continuous" as used above implies that during a cutting action of the cutting means 18, a portion of the strip 70 being removed remains attached to the cast 12. However, the cutting means 18 may be adapted to completely shear the strip 70 from the cast 12, for example, when it is required to terminate the strip 70 to remove the cast-cutter or to change the direction of the cast-cutter.

The upper 110 and side walls 112 of the strip exit 72 are outwardly tapered to allow the cast-cutter to readily be moved in an arcuate or curved path when in use, and also to prevent the strip 70 from blocking the strip exit 72.

A similar embodiment to that shown in Figure 5 is shown in Figure 6, the difference being the existence of a floor portion 76 which closes the underside of the aperture 66 in the fixed portion 64. The floor portion 76 guides the strip 70 towards the strip exit 72 and when the fixed portion is mounted on, or forms part of the protective shoe, the floor portion 76 prevents the sheared cast

material from being ejected towards and against the skin of the patient. Additionally, the floor portion may also provide a barrier between the second, moveable member 68 and the patients skin.

The upper 110, lower 114 and side walls 112 of the strip exit 72 of the embodiment shown in Figure 6 are outwardly tapered for the same reasons as discussed above with reference to Figure 5.

Various forms of moveable second portions of cutting means for use on a cast-cutter of the present invention will now be described with reference to Figures 7 to 9. Referring first to Figures 7 (a) to (c), the is shown side, rear and bottom views respectively of a moveable portion 78. The moveable portion 78 includes curved cutting edges 80 which curve downwards from a leading edge 82 to a trailing edge 84 of the moveable portion 78. As shown more clearly in Figures 7 (b) and (c), the moveable portion comprises a channel 86 located between the cutting edges 80, such that, in use, the area of the contact surfaces 88, 90 is reduced which increases the cutting pressure which is exerted on the cast by the moveable member 78. Additionally, the contact surfaces 88, 90 assist in preventing the cast material from slipping during a cutting action.

An alternative moveable member 92 is shown in Figure 8. In this embodiment, the cutting edge 94 is serrated,

such that when in use a number of contact points are created, which provides for improved gripping of the cast material and improved mechanical cutting properties. For example, the cutting force imparted by the cast-cutter will be distributed by point loading onto the cast material, which will maximise the cutting pressure exerted on the cast and will better induce crack propagation, particularly in rigid cast material

A further alternative embodiment is shown in Figure 9, wherein the cutting edge 98 of the moveable member 96 is curved in an arch profile between leading 100 and trailing 102 edges of the moveable portion. This particular form of moveable member 96 is advantageous particularly in the removal of individual discrete portions of the cast material, as opposed to complete strips, as cutting will be effected initially from the leading and trailing edges 100, 102, and then progressively by the side edges of the member 96 towards its centre, and will again maximise the cutting pressure. Although not apparent from Figure 10, the moveable member 96 may have a similar channel to that channel 86 shown in Figures 7 (b) and (c). Again, the specific shape of the moveable portion 96 will assist in gripping the cast material when the cast cutter is in use.

Reference is now made to Figure 10 in which there is shown a simplified perspective view of cutting means of the present invention including a safety guard 104 located

around the moveable member 106, and above the fixed member 108. In use, the guard 104 is moved into place in order to prevent injury by trapping a finger or the like and to prevent portions of cast material being discharged from the cutting means. The safety guard 104 includes an additional safety switch (not shown), which only allows the cast-cutter to be operated when the guard 104 is securely and properly located in its guarding position.

It should be understood that the embodiments hereinbefore described are merely exemplary of the present invention and that various modifications may be made thereto without departing from the scope of the invention. For example, the fixed portion of the cutting means may be mounted separately from the protective shoe, for example on the connecting member which connects the protective shoe to the body portion of the cast-cutter. Additionally, a collector may be provided which collects and retains the cuttings of cast which are removed during operation. The collector may be mounted on the cast-cutter or alternatively may be located separately therefrom.

Furthermore, the cast-cutter may be powered by a battery pack or the like mounted on or in the body of the cast-cutter.

In the embodiments shown, the cutting means operates by relative reciprocal or pivotal motion between the first and second cutting portions. However, cutting may be

effected by a relative rotational motion or the like. Additionally, the cutting means, in use, may also assist in moving the cast-cutter along the length of the cast.

The cast-cutter may additionally comprise control means in association with sensing means which allow the cutting means of the cast-cutter to only be activated when a cast section is located between the first and second cutting portions.

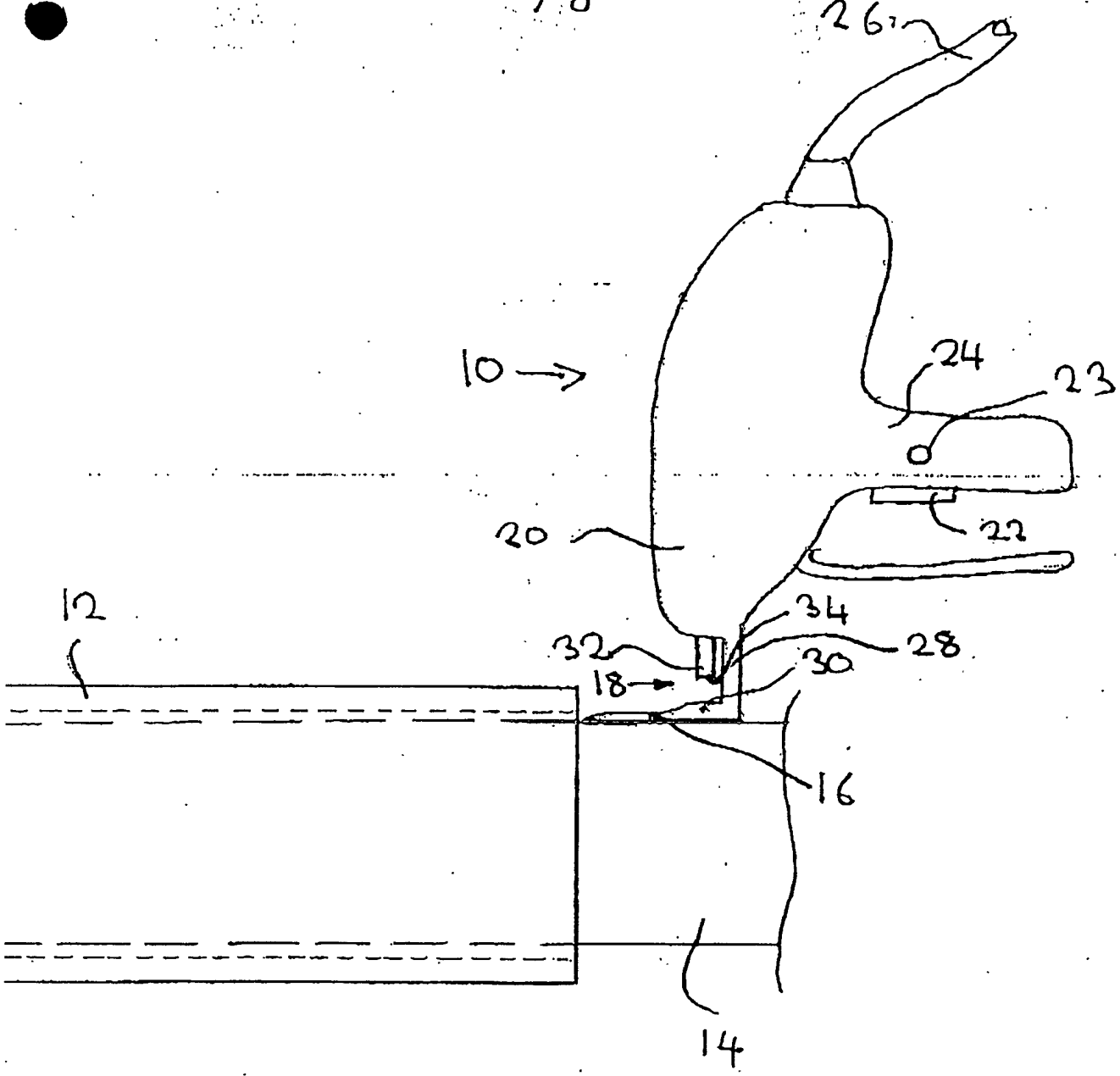


FIGURE 1

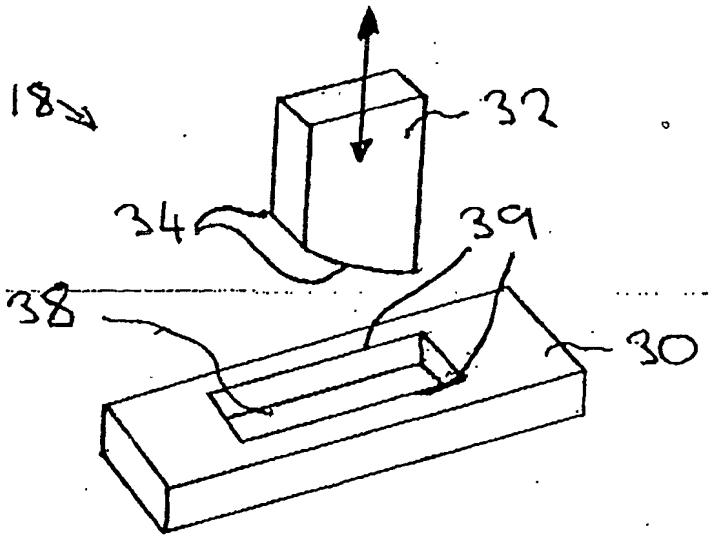


FIGURE 2

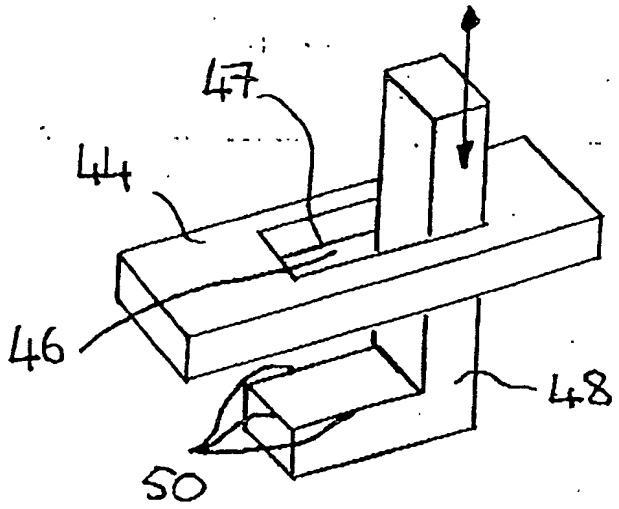


FIGURE 3

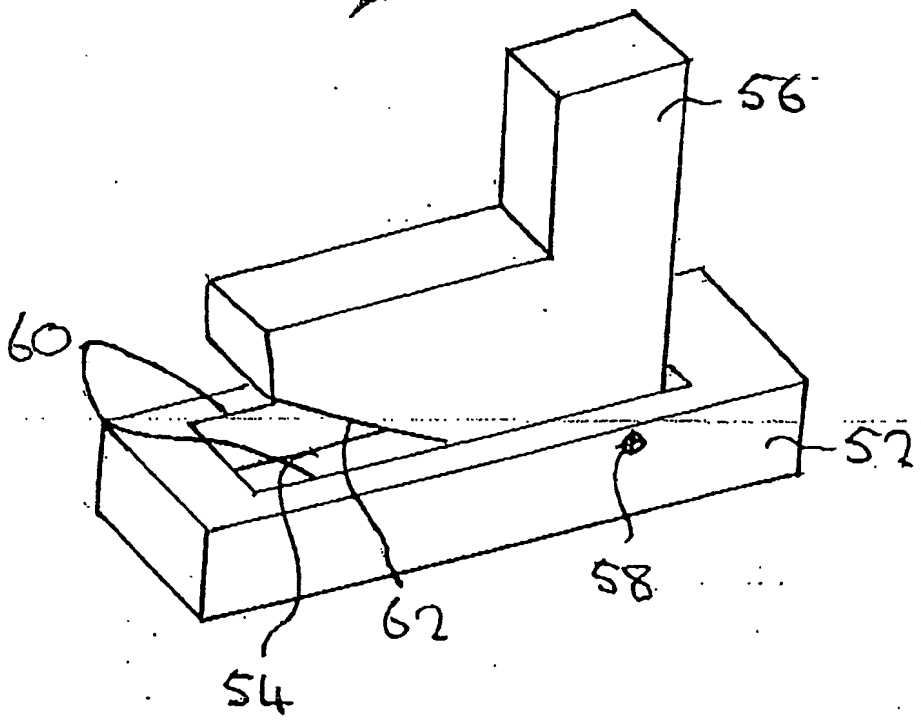
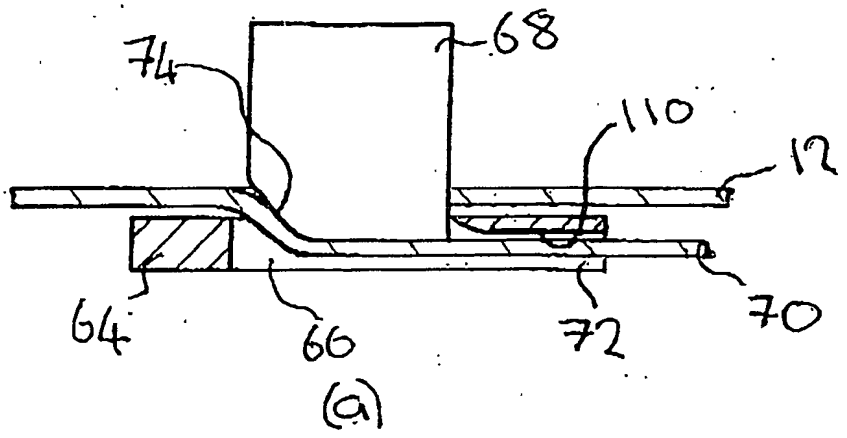
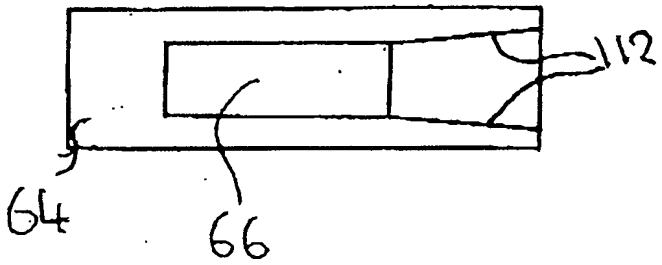


FIGURE 4

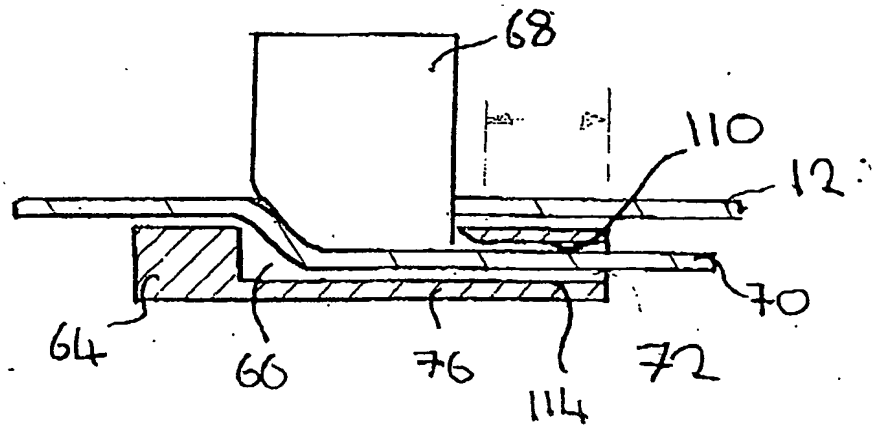


(a)



(b)

FIGURE 5



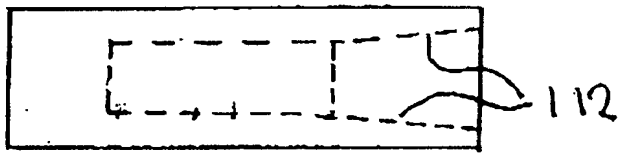
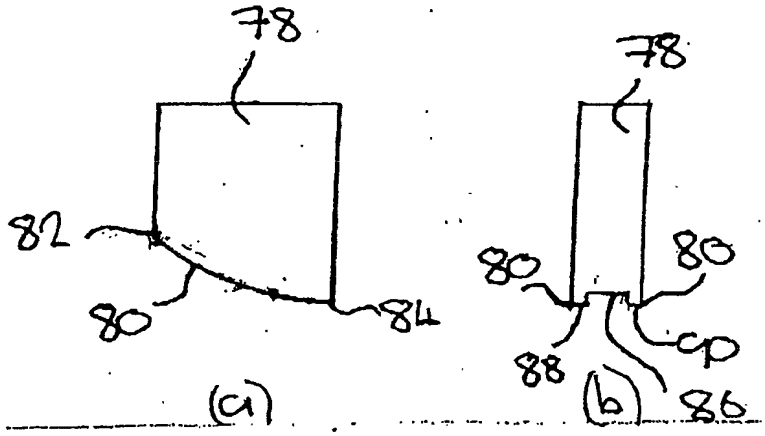


FIGURE 6



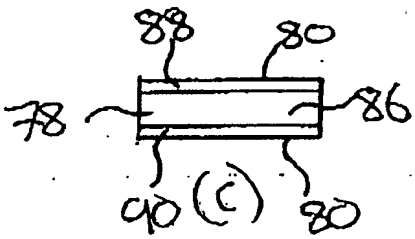


FIGURE 7

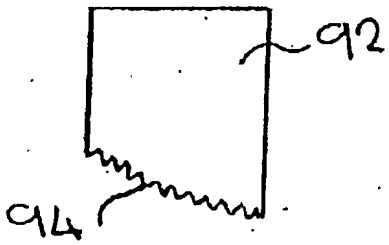


FIGURE 8

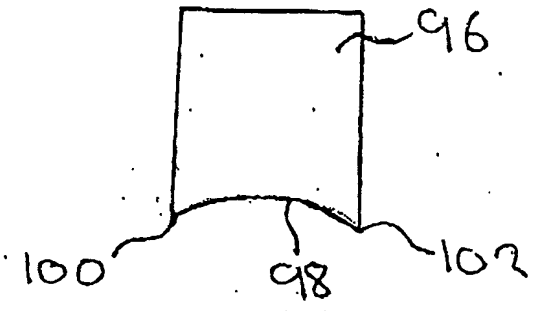


FIGURE 9

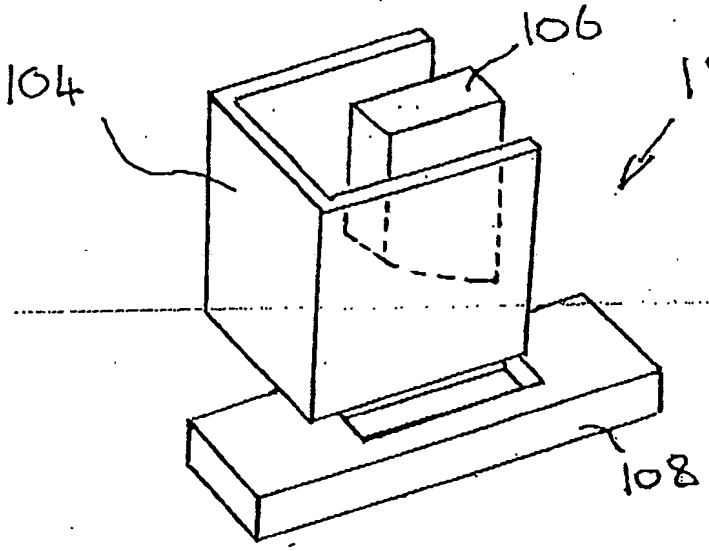


FIGURE 10